ENERGY CENTER OF WISCONSIN

Minnesota Plug-Load Research Study
Some Preliminary Data

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LBL Seminar

November 18, 2009

YOUR PARTNERS IN ENERGY RESEARCH, EDUCATION & CONSULTING

Nested Sample
Three Levels of Data Collection

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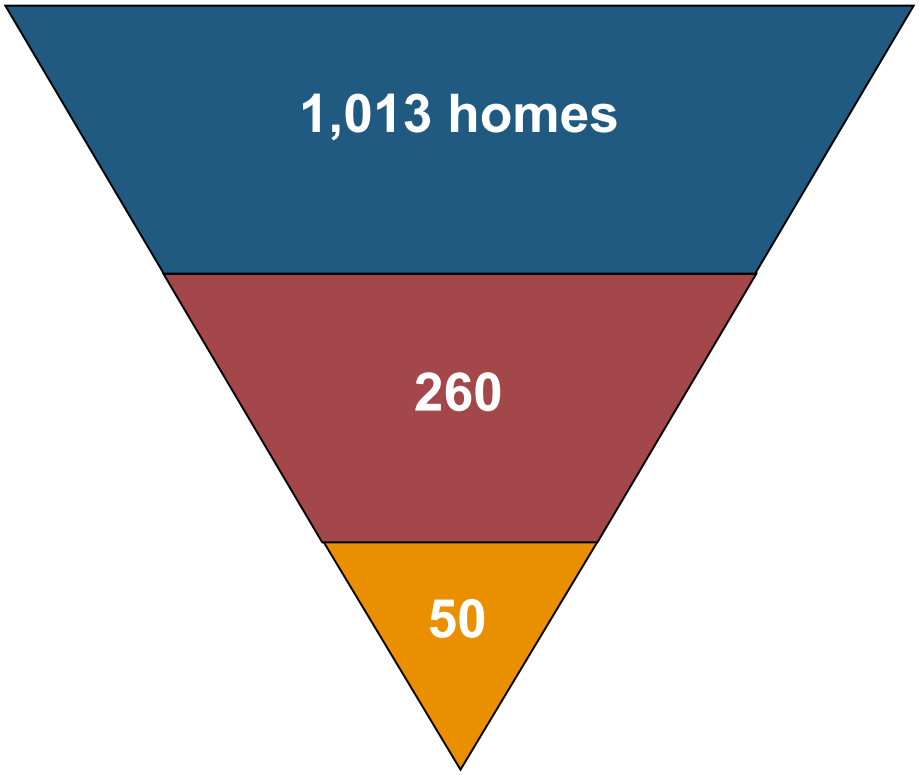


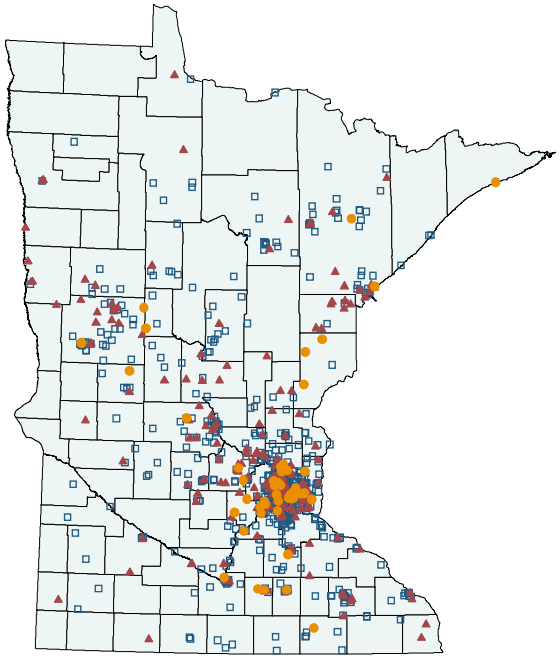
□ **Telephone Survey**
- Demographics
- Attitudes
- TV & Computer counts

▲ **Mailed Saturation Survey**
- Computer & peripheral details
- TV & peripheral details
- Saturation for other plug-in devices

● **Site Visits**
- Device inventory
- Metering (5-30 devices/home, 1 mo.)
- Household interview

Have analyzed 3 of 4 rounds of site-visit data (38 homes)

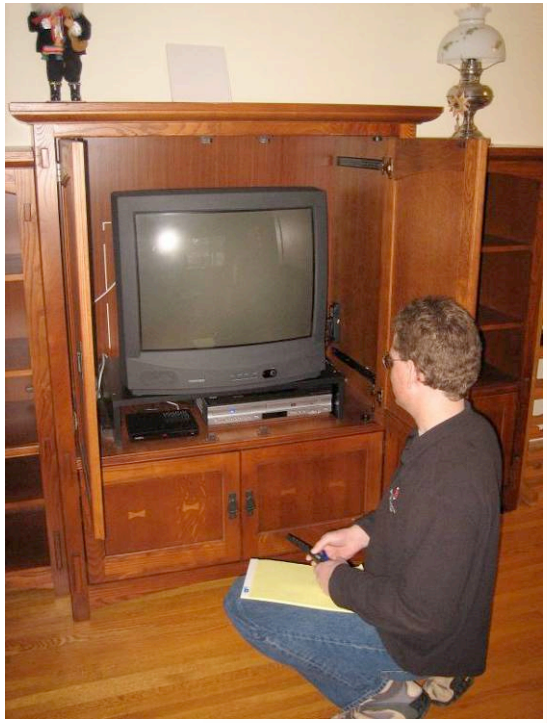
Stratification



- 4 Rounds of data collection (for seasonal balance)
- 5 Geographic strata
- 4 demographic strata:
  - "Singles" (12%)
  - "No kids" (32%)
  - "Families" (40%)
  - "Elders" (16%)

On-Site protocol

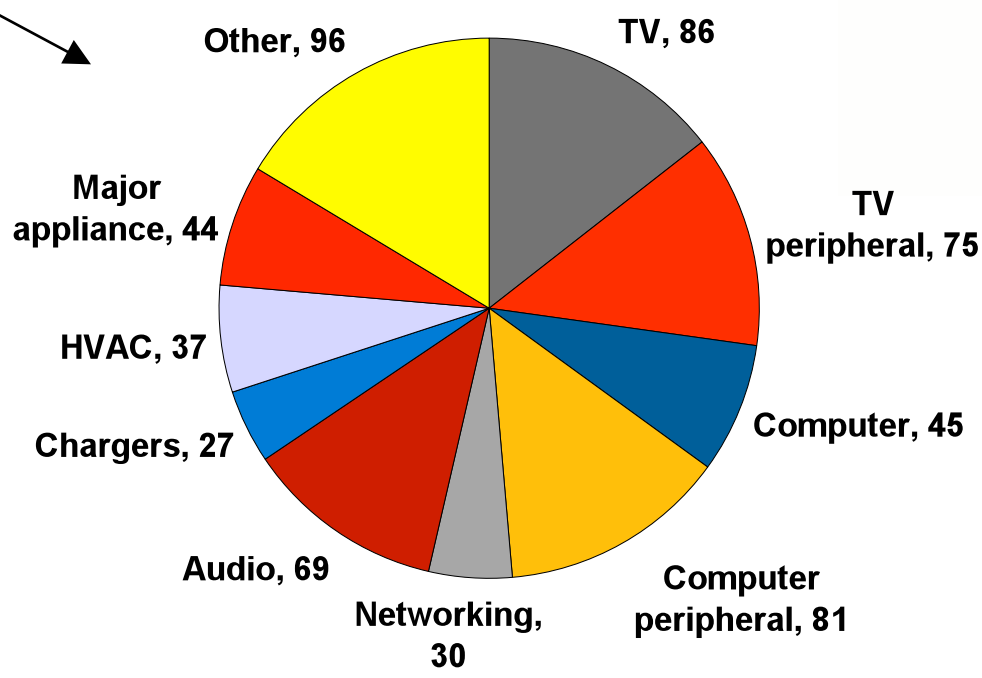
- Inventory all plug-in devices in the home
- Select and install metering on 5-35 items
  - focus on TV and computer centers
- Return one month later
  - removing metering
  - interview household
    - review meter readings
    - explore savings strategies



6-minute interval data
90-second interval data
KILL A WATT™
METER CLOCK
watts up? PRO
SELECT
MODE
32
95.1
68

For first 38 homes (Rounds 1-3)

- Inventoried 1,409 devices
- Metered 598 devices



Preliminary data!

Focus on In-Home Savings Opportunities

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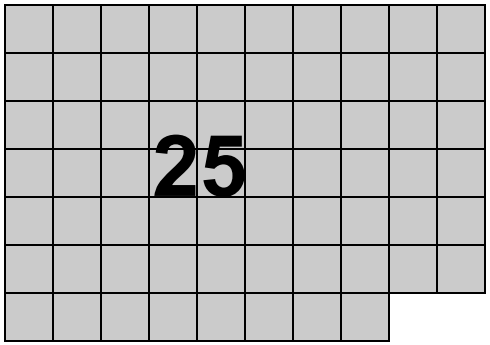
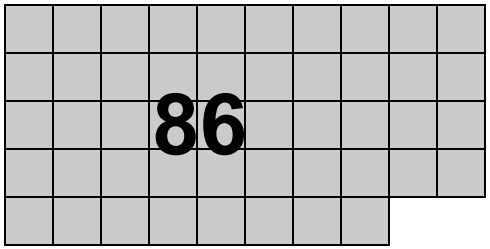
- For each metered device:
  - review metering data: is there a savings opportunity (25+ kWh/yr)?
    - categorize type
    - estimate annual kWh
  - from interview, how likely to implement?
    - low ~<15% probability
    - medium ~15-85%
    - high ~>85% probability

Computer Power Management

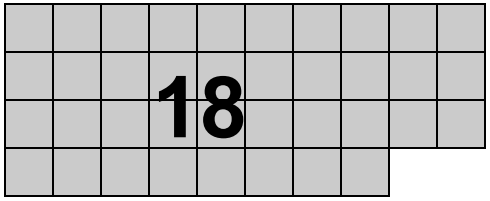


Unplug (high standby or rarely used)



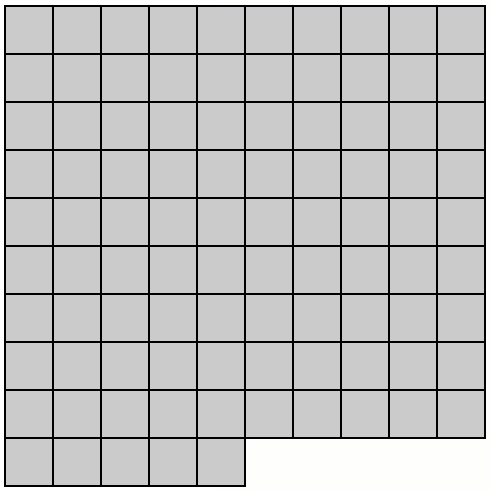
Smart power strip

Turn off when not in use



Use a timer

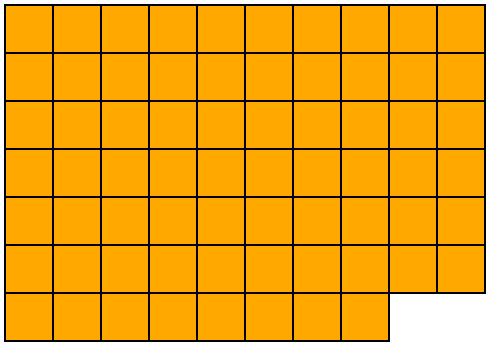
Eliminate 2nd refrigerator or freezer



Total: 170 identified opportunities in 38 homes

Preliminary data!

Computer Power Management



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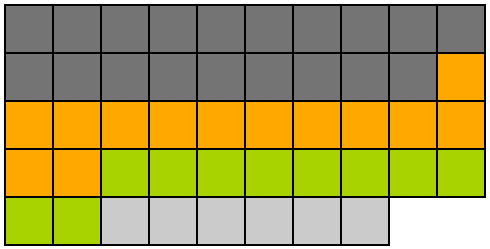

Smart power strip

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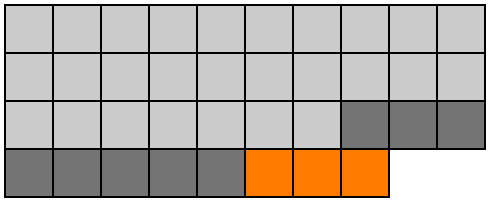

Use a timer

computer & peripherals

TV & peripherals

Audio

Other

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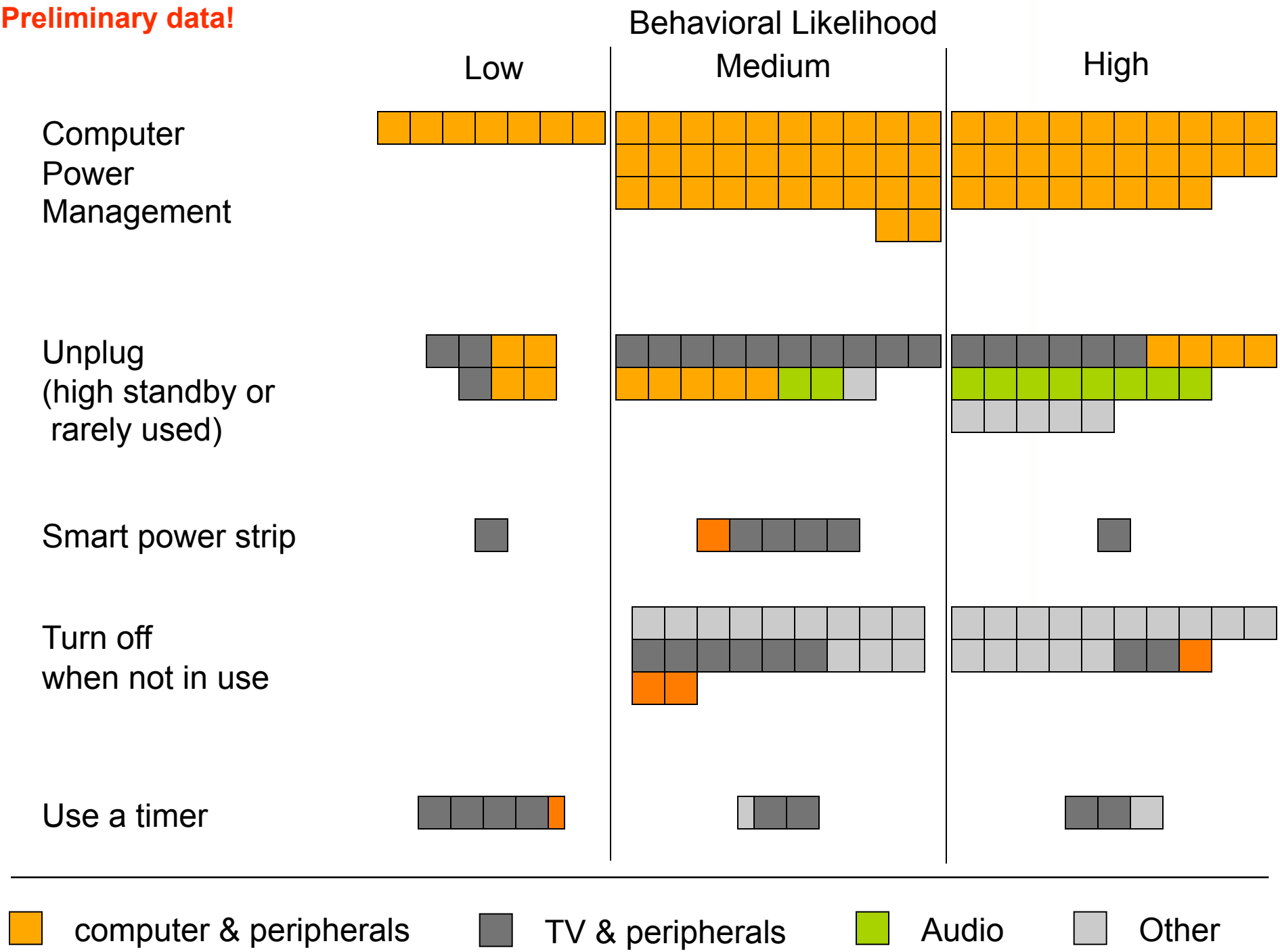
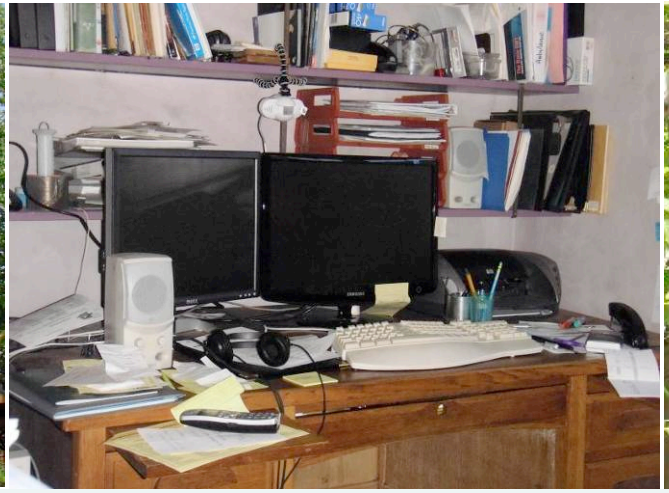
Preliminary data!

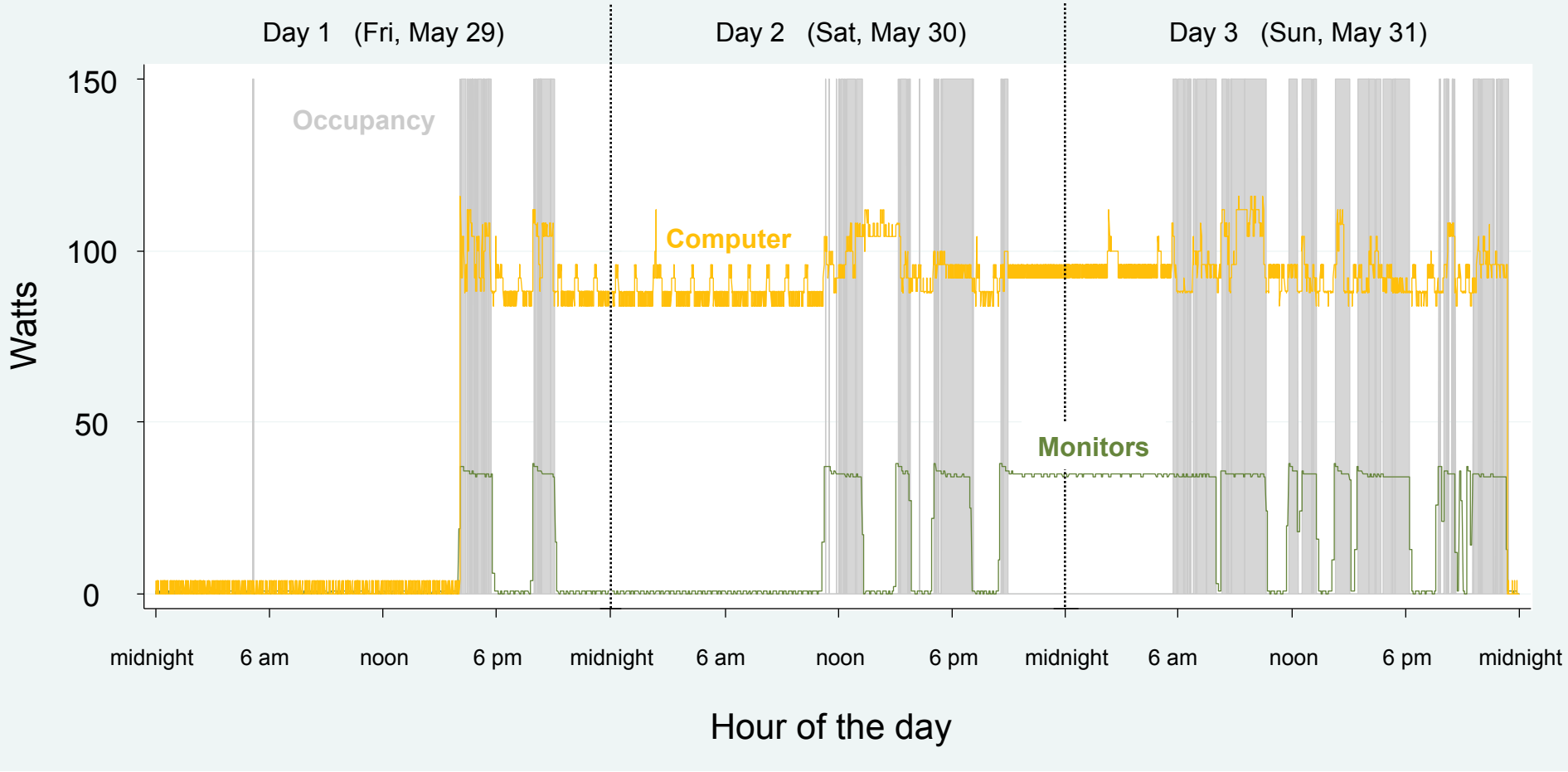
Preliminary data!



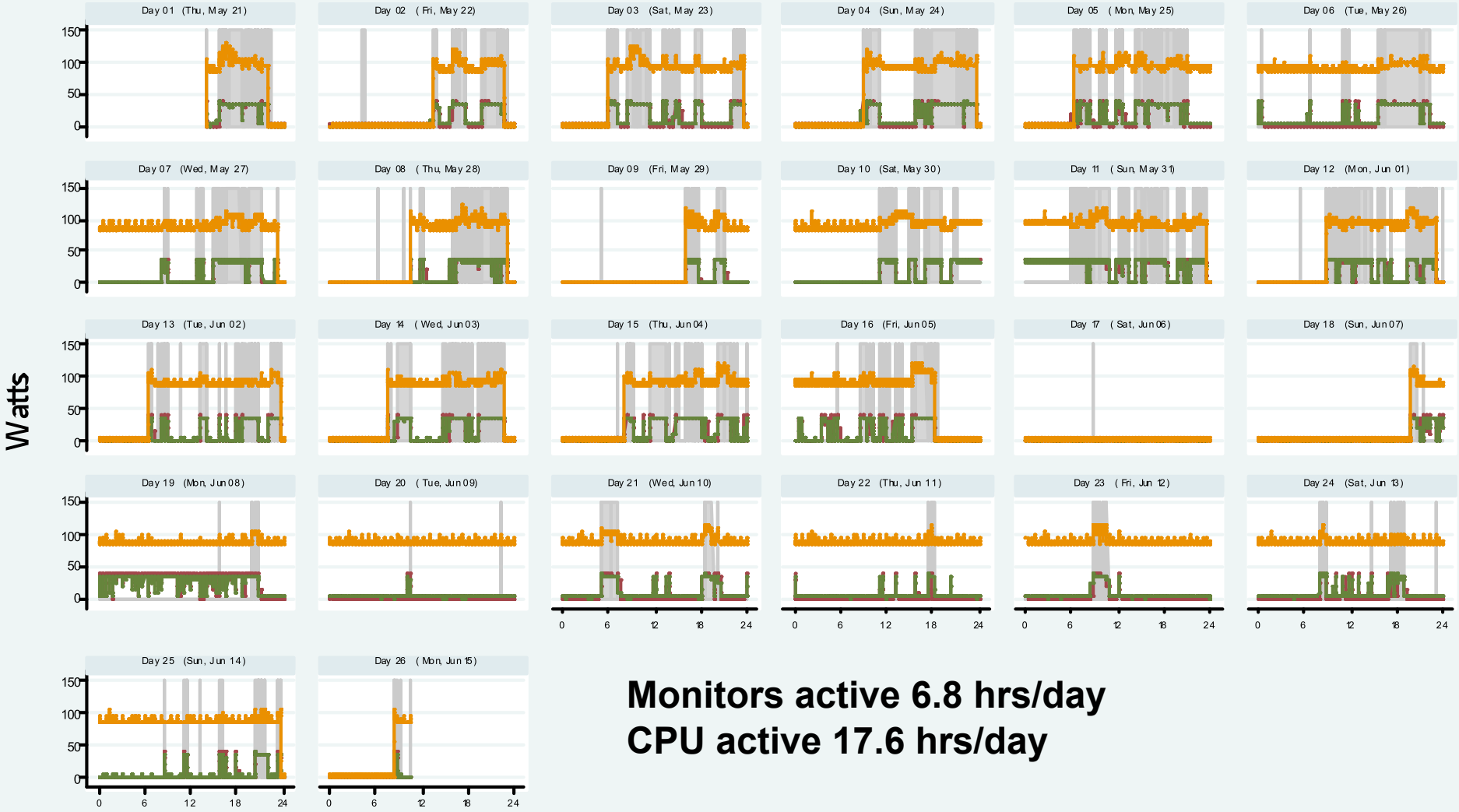
Computer Power Management

- Computer saturation
  - 0.85 desktops/HH
  - 0.59 laptos/HH
- From sites where we were able to check desktop PM settings:
  - Monitor off enabled ~80%
  - Computer sleep/hibernate ~20%




Day 1 (Fri, May 29)
Day 2 (Sat, May 30)
Day 3 (Sun, May 31)
Occupancy
Computer
Monitors
Watts
150
100
50
0
midnight
6 am
noon
6 pm
midnight
6 am
noon
6 pm
midnight
6 am
noon
6 pm
midnight
Hour of the day

Site 24



graphs by date

For 34 metered desktop computers:

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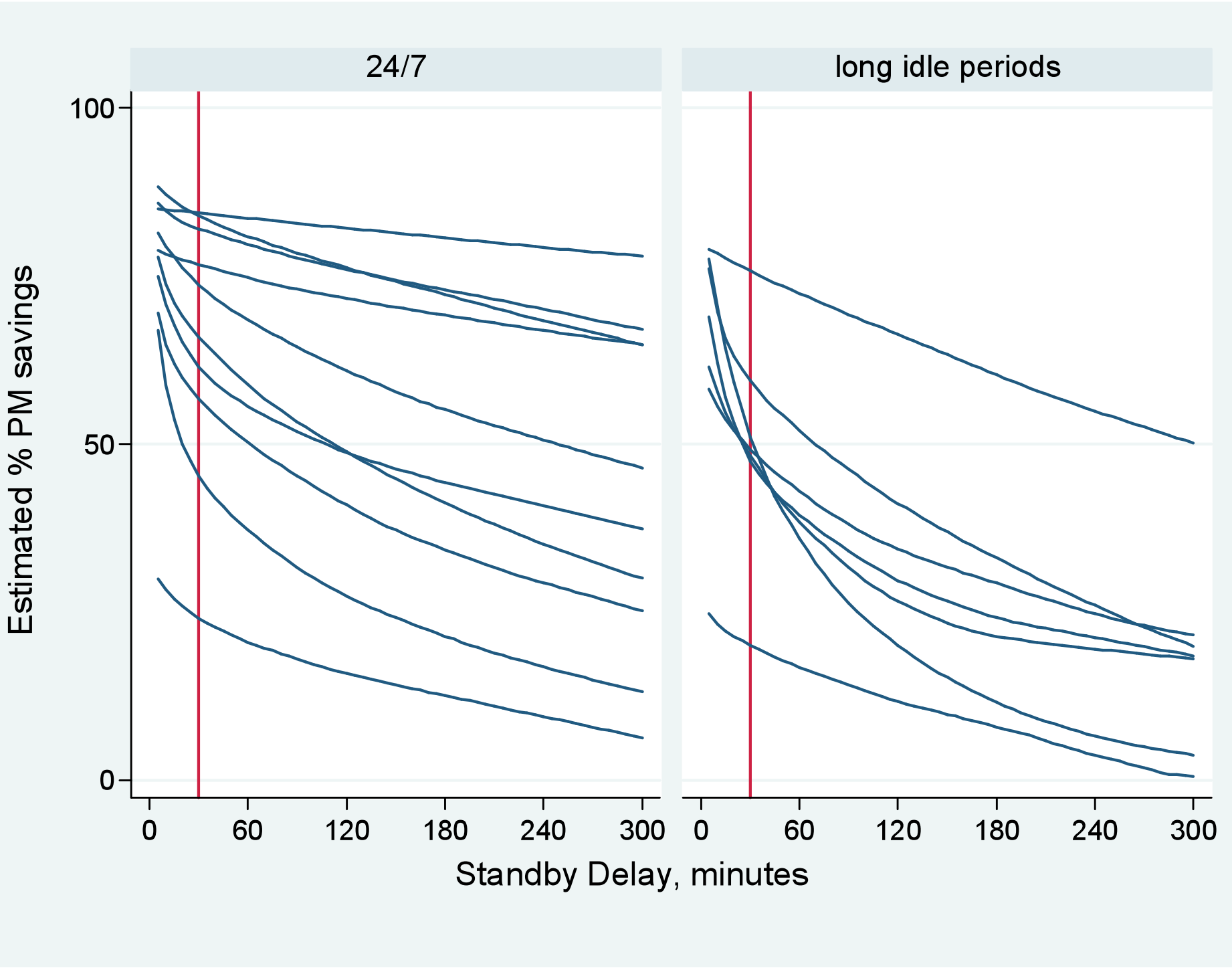
	% of desktops	Avg. Annual kWh used*	Est. Annual PM Savings (kWh)**
Long idle periods	35%	520	190
Left on 24/7	30%	650	400
On only when in use	20%	110	15
Not used much	15%	50	2
Overall	100%	410	190

*computer + monitor(s) **30-minute off delay
n=28

Preliminary data!


24/7
long idle periods
Estimated % PM savings
100
50
0
0
60
120
180
240
300
Standby Delay, minutes

Turning savings potential to savings
34 desktops - revisited

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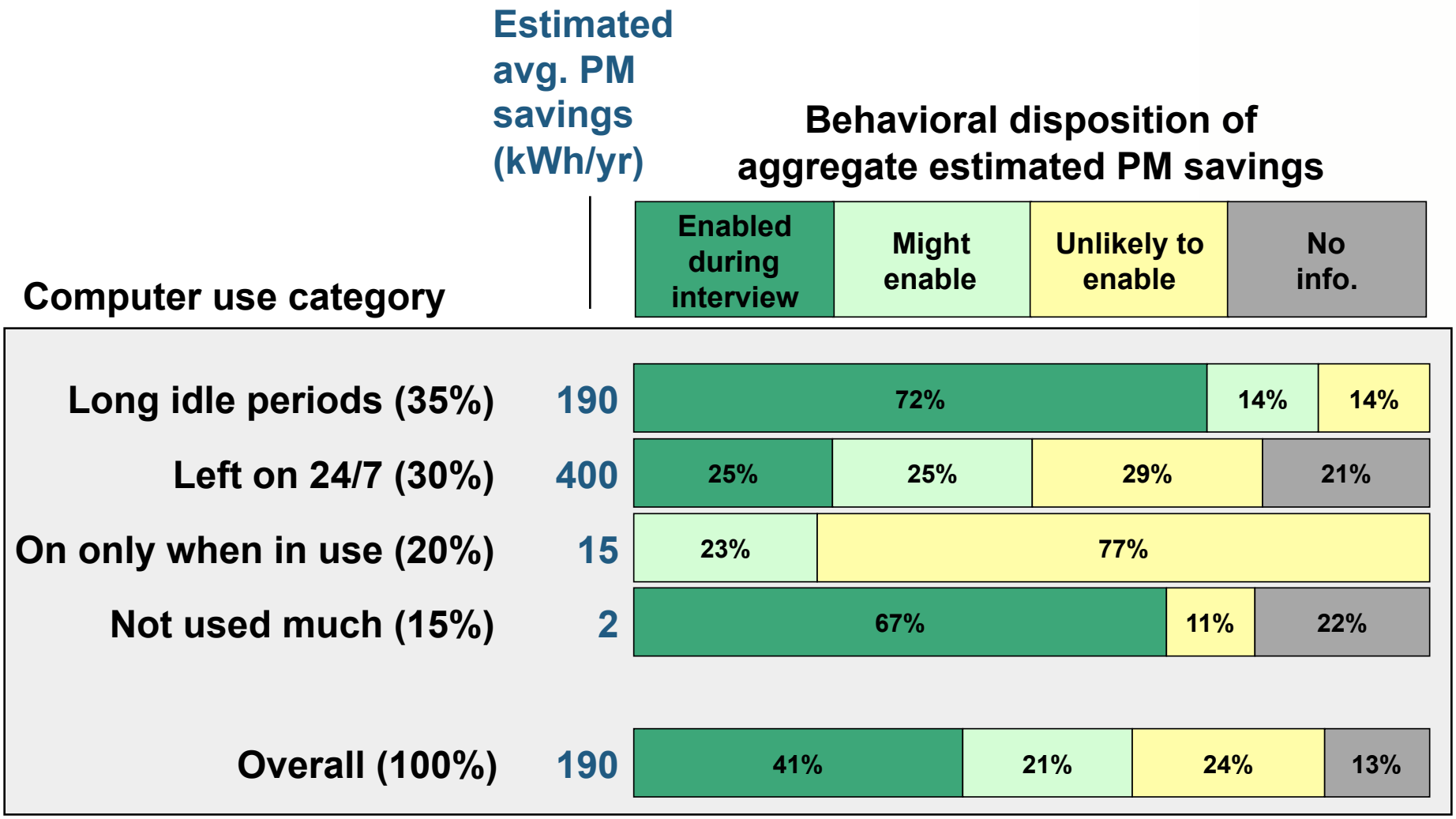

Preliminary data!

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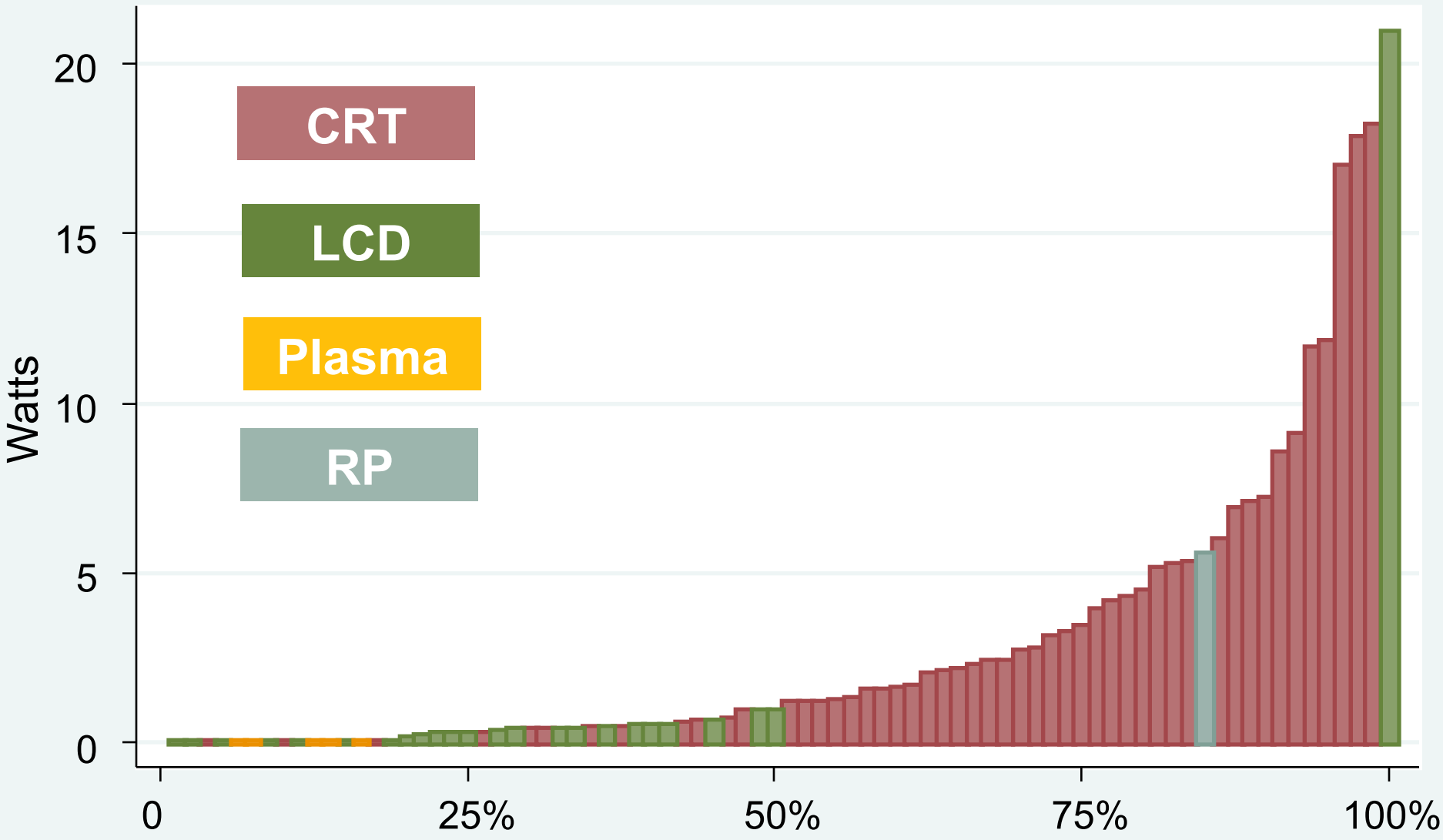
Unplug Things

- Combination of
  - high standby
    - savings even if used frequently
  - rarely used
    - not much hassle to keep unplugged

TV Standby Power Draw



Preliminary data!

n=80

Audio – little used, sometimes high standby

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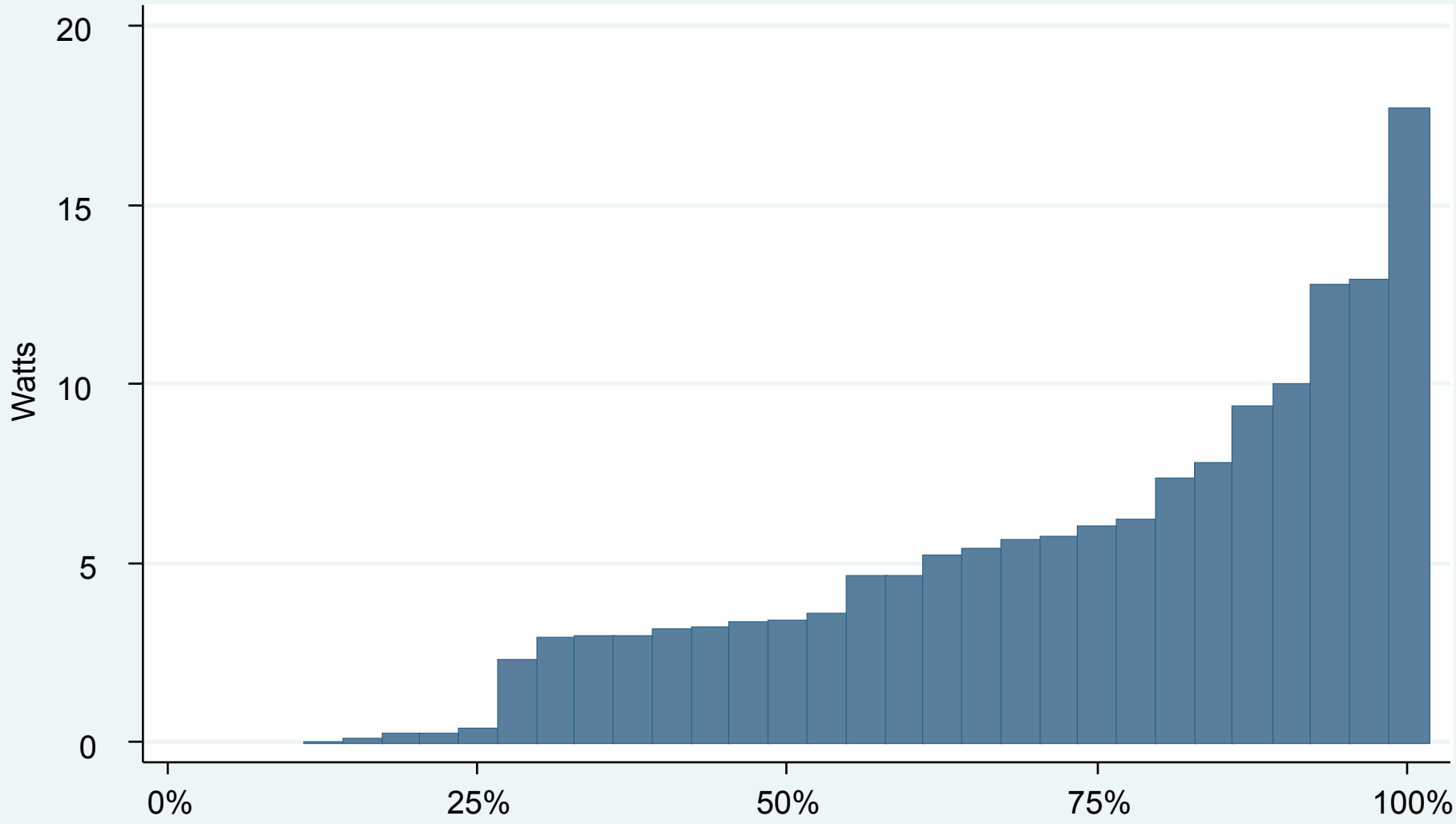
- 40% of audio devices not used at all during month
- 66%% used <1 hr/day

n=34

Preliminary data!

Printer standby power draw



Preliminary data!

n=32

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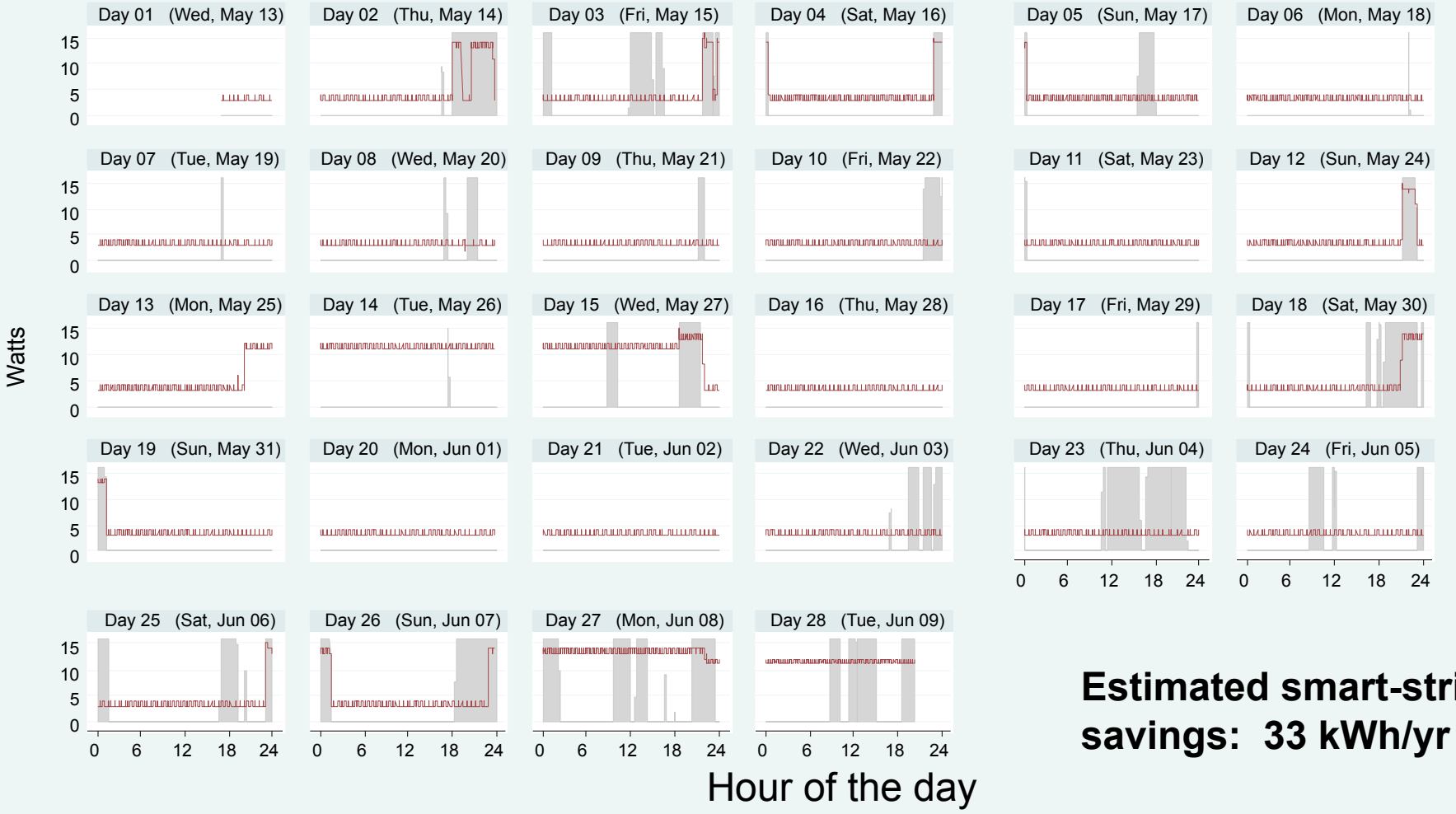
Smart Power Strips

- limited savings?
- take-back?

Smart-strip example:
DVD/VCR connected to TV



Estimated smart-strip savings: 33 kWh/yr

graphs by date

TV on/off Status

DVD/VCR watts

Site 20

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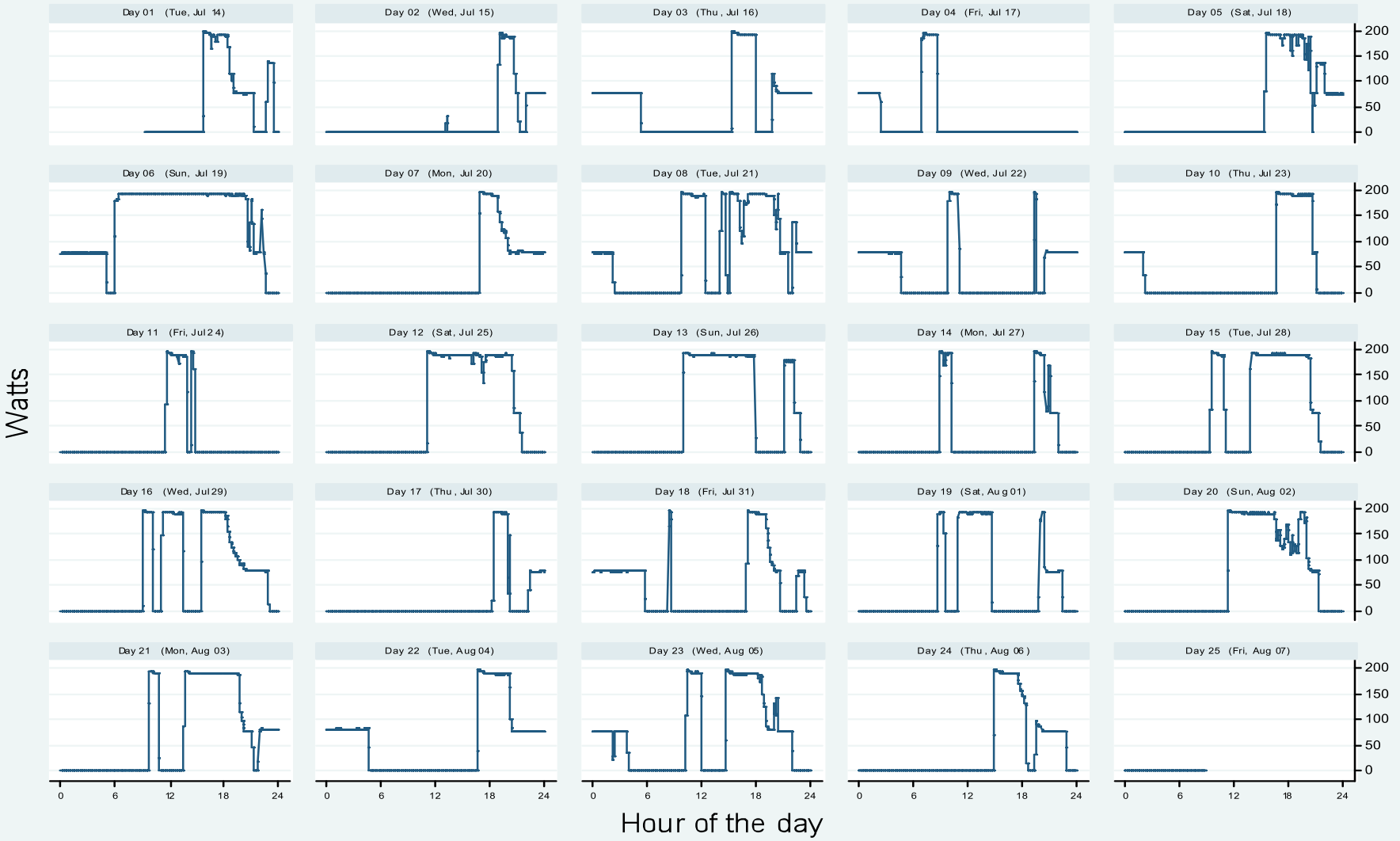
Turn Things Off

- Most savings opportunities from a few HVAC-related items
  - e.g., bsmt space heater running in June
- Some cases of electronics left on for extended periods

TV left on overnight



graphs by date

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Timers

- Considered three applications
  - Sat./Cable boxes where TV use schedule is predictable
  - Computer networking equipment if computer use schedule is predictable (and no wireless use)
  - tool/cordless appliance chargers w/ high standby

Sat./cable box power draw

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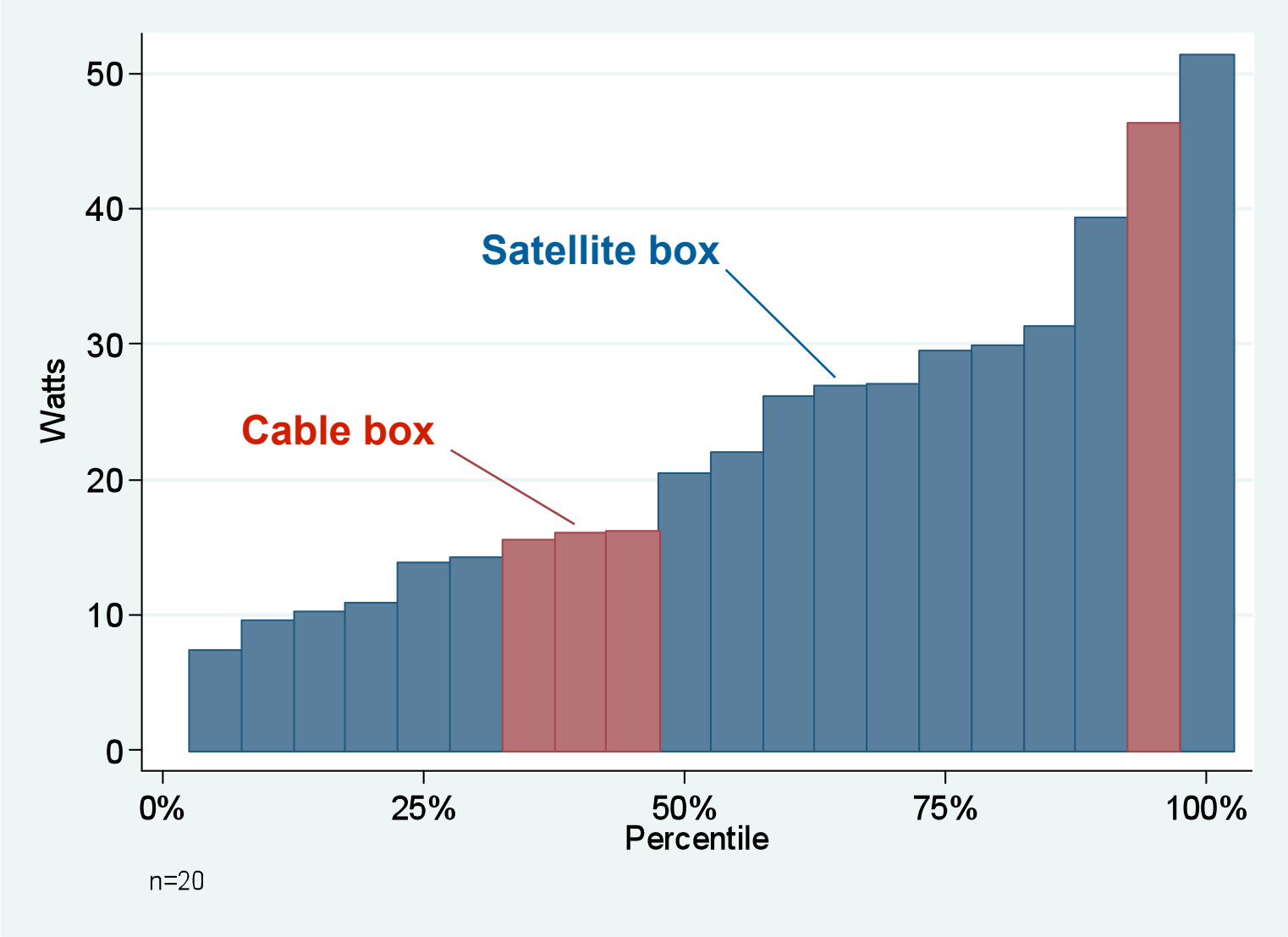

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Paths to savings…

- Programs targeted at households
  - Power management for legacy desktops
  - Unplug little-used devices
  - Portable HVAC awareness
- Federal standards/guidelines
  - Standby power
  - Sat./cable box power and operation
  - Default power management settings
  - Auto-off for devices w/o large displays

Stay tuned!

(but don't leave your computer on)

- **www.ecw.org**
  - **Final study report available by mid-January 2010**
  - **Webinar scheduled for January 27, 2010**
- **This project is funded by the Minnesota Office of Energy Security and Minnesota Power Company**